



Oregon

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February 24, 2009

Sean Sheldrake, RPM
Environmental Cleanup Office
ECL-115
U.S. Environmental Protection Agency Region 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

Re: Arkema Groundwater Source Control Measure
Arkema Portland Plant
ECSI No. 398

Dear Mr. Sheldrake:

Over the course of the last 2 years, the Oregon Department of Environmental Quality (DEQ), Environmental Protection Agency (EPA) and Arkema have been engaged in the development, assessment and selection of a groundwater source control measure to stop heavily contaminated groundwater at the Arkema site from discharging to the Willamette River. DEQ recommends the following initial groundwater source control measure at the Arkema Portland site:

- Barrier wall located upland from the top of the bank on Arkema Lot 4 and the southern portion of Lot 3. The wall is set back from the top of the bank based on geotechnical constraints, but it is to be located as close to the top of the bank as practical.
- Wall construction is a conventional slurry trench type barrier wall.
- The wall will be installed through site fill and alluvium to the top of the top of the underlying basalt bedrock and range in depth from approximately 50 to 80 feet below ground surface.
- Groundwater extraction using conventional vertical wells, ex situ groundwater treatment and discharge of treated groundwater to the Willamette River under a National Pollutant Discharge Elimination System (NPDES) permit
- Ex situ groundwater treatment which includes:
 - Chemical precipitation reactor with aeration, and pH adjustment via sodium hydroxide;
 - Solids handling system (i.e., clarifier with polymer feed, sludge holding tank, filter press, and associated equipment);
 - pH adjustment tank;
 - Optional post-clarification solids filter if required;
 - Fluidized bed reactor with solids filter for biomass handling, with the option of

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- utilizing either the packed bed reactor and EHC®/sand reactor; and
- Two liquid-phase granular activated carbon vessels in series.

Per the Portland Harbor Memorandum of Understanding, DEQ provides EPA and Partners an opportunity to review and comment on this decision. Review comments are requested by March 31, 2009. Because source control at the Arkema site is subject to the EPA Early Action, DEQ is coordinating this review through you rather than the EPA Portland Harbor Source Control Coordinator.

Project Background

The Arkema site is located at 6400 NW Front Avenue, Portland, Oregon, occupying approximately 50 acres along the Willamette River at approximately River Mile 7.5. The general location of the Arkema Site is shown on Figure 1-1. All manufacturing operations have ceased at the Site, and significant demolition of the facility buildings has occurred.

Historical manufacturing operations at the Site began in 1941 by Pennsylvania Salt Manufacturing, later known as Pennwalt Corporation. Between 1941 and 2001 various chemicals were produced at the facility, including but not limited to sodium chlorate, potassium chlorate, chlorine, sodium hydroxide, dichlorodiphenyltrichloroethane (DDT), sodium orthosilicate, magnesium chloride hexahydrate, ammonia, hydrogen, ammonium and sodium perchlorate, and hydrochloric acid.

Waste from the manufacture of DDT that contained DDT, chlorobenzene, and spent sulfuric acid was discharged to a floor drain in the DDT process building at the Site from approximately 1947 to 1948. The floor drain is believed to have been connected to a pipe that discharged to the Willamette River. From 1948 until 1954, DDT manufacturing process waste was discharged directly to an unlined on-site settling pond, which was expanded to include a 285-foot overflow trench in 1950. A chlorobenzene recovery plant was added in 1950. Sodium and ammonium perchlorate were manufactured at the Arkema Site from 1958 until 1962. Release of perchlorate occurred during the manufacturing process from the Sodium Perchlorate Process Area and the Ammonium Perchlorate Process Area. Sodium chlorate was manufactured on site from 1941 until 2001. Sodium bichromate, which contains hexavalent chromium, was used in the chlorate manufacturing process. Releases of hexavalent chromium occurred during the manufacture of sodium chlorate in the Sodium Chlorate Process Area.

Groundwater Contaminants of Concern

The primary groundwater contaminants of concern are chlorobenzene, DDT and isomers, hexavalent chromium, perchlorate, chloride and chloroform. Furans, apparently associated with the early production of chlorine, are also present in groundwater within the Acid Plant Area Figure 5 and Tables 1 and 2.

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Upland Source Control - RI/FS

During the remedial investigation (RI) Arkema conducted a number of lab and field pilots, and interim remedial measures to evaluate in situ treatment options for groundwater contaminants. These included:

- In situ reduction of hexavalent chromium using calcium polysulfide
- In situ chemical oxidation of chlorobenzene using sodium persulfate
- Chlorobenzene treatment by air sparging/vapor recovery
- Lab studies for the in situ bioremediation of perchlorate

With the need to accelerate groundwater source control to support the EPA Early Action, Arkema suspended plans for an in situ perchlorate treatment pilot and its overall in situ program in favor of a groundwater barrier wall/groundwater extraction system advocated by EPA.

At this time, upland cleanup work is divided into two parallel programs. Source control and the feasibility study (FS) /Record of Decision (ROD) path. Source control has three components consisting of groundwater, stormwater and the riverbank/erodible soils.

Groundwater Source Control

The purpose of the proposed groundwater containment barrier wall and groundwater extraction system is to prevent migration of groundwater contaminants from the uplands to the EPA Early Action Area. This action is limited to the southern half (Lot 4 and a portion of Lot 3) of the Arkema site which has the most significant groundwater plumes migrating to the Willamette River.

Groundwater contaminants levels are substantially lower in the northern half of the site. In addition, groundwater contaminants in the northern portion of the site are a mix of those related to Arkema operations and those migrating onto and across the site from the former Rhone-Poulenc (RPAC) facility. Starlink Logistics Inc. (SLLI) is currently revising a Source Control Evaluation (SCE) for the RPAC site. The revised SCE report is due June 2009. Once this report is accepted by DEQ, DEQ will evaluate the need for groundwater source control along the northern portion of the Arkema site and direct Arkema and/or SLLI to conduct source control alternative evaluations (i.e., focused feasibility study) as appropriate.

Riverbank Source Control

Arkema submitted a riverbank source control evaluation document in December 2008. It is currently under review. However, as we have discussed, in DEQ's opinion the entire riverbank screens in as a high priority for source control. This is based on the presence of DDX compounds and dioxin/furans in bank soils. DEQ will direct Arkema to evaluate removal and stabilization options along the bank to prevent migration of riverbank contaminants to the river.

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Stormwater Source Control

Arkema submitted a draft Stormwater Focused Feasibility Study (FFS) to rework the stormwater system at the site and limit discharge of hazardous substances to the Willamette River. A revised Stormwater FFS is due in March 2009

FS/ROD

The upland FS will evaluate upland remedial alternatives for the entire site. This will include evaluation of remedial options to remove or treat the upland groundwater plume source areas. The upland FS will also evaluate the effectiveness of interim source control measures and the need to augment them.

Groundwater FFS Evaluations

The Groundwater FFS evaluated three wall types: sheet pile, traditional slurry wall and vibrated beam slurry wall. Three wall locations were considered: toe of the riverbank, top of the riverbank and a top of the riverbank fully enclosing wall. The FFS also evaluated disposal options for treated groundwater (discharge to the Willamette via NPDES permit, deep groundwater injection and discharge to a publically owned treatment works). Supporting studies included a groundwater modeling report (Appendix A), a geotechnical evaluation report (Appendix B), slurry materials testing report (Appendix C), groundwater treatability study (Appendix D submitted under separate cover).

DEQ favors the traditional slurry wall located at the top of the bank for the following reasons.

- It should be an effective hydraulic barrier.
- It appears to be compatible with site contaminants.
- It should provide a better seal against the underlying basalt than a sheet pile wall or vibrated beam wall.
- Because a traditional slurry wall is not vibrated or hammered into place there is less potential to mobilize and exacerbate the distribution of DNAPL.
- While portions of a slurry wall may have to be reconstructed, it is not incompatible with future bank removal/design or in-water work.

Groundwater modeling concluded that there is limited benefit resulting from a fully enclosed wall design. Groundwater modeling results that led to this conclusion need to be verified. Future pump tests and monitoring of the proposed wall/groundwater extraction system will allow validation of the groundwater model conclusions. DEQ will require that a fully enclosed wall alternative be evaluated in the upland FS.

DEQ also favors the discharge of treated groundwater to the Willamette River under an NPDES permit.

Proposed Groundwater Source Control Action

The proposed groundwater source control action is the first of two measures. This initial action is limited to the southern half (Lot 4 and the southern portion of Lot 3) of the site. The second measure (to be determined) will address groundwater contaminants present on the northern portion of the Arkema site (Lots 1, 2 and the remainder of 3) as necessary. Again the proposed action consists of:

- Barrier wall located upland from the top of the bank on Arkema Lot 4 and the southern portion of Lot 3. The wall is set back from the top of the bank based on geotechnical constraints, but it is to be located as close to the top of the bank as practical.
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 - pH adjustment tank;
 - Optional post-clarification solids filter if required;
 - Fluidized bed reactor with solids filter for biomass handling, with the option of utilizing either the packed bed reactor and EHC®/sand reactor; and
 - Two liquid-phase granular activated carbon vessels in series.

The approximate location of the proposed barrier wall is shown on Figure 4-1.

Figure 3 shows the relationship of the significant groundwater plumes relative to the proposed barrier wall location.

Figures H1- H12 provide more detailed distribution of chlorobenzene, DDX, hexavalent chromium and perchlorate in the three alluvial groundwater zones overlying the basalt (i.e., shallow, intermediate and deep) relative the proposed wall.

Figure 4-7 illustrates the conceptual flow diagram for the ex situ treatment of the extracted groundwater.

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Treated groundwater will be discharged under an NPDES permit. The draft permit is in development and will be subject to public review and comment. At this time, I expect it will be available for review late March/early April 2009.

Once DEQ approves the proposed action, Arkema will initiate predesign investigations, and prepare draft wall, extraction system and monitoring plans. Subsequent plans (e.g., groundwater monitoring to evaluate capture) will be available for TCT review.

Background Documents

ERM, September 2008, Final Response to ODEQ Comments Focused Feasibility Study Arkema, Inc. Facility in Portland Oregon (CD included).

ERM, May 2008 Draft Focused Feasibility Study Groundwater Source Control Interim Remedial Measure, Arkema Chemicals Facility, Portland Oregon (CD Included).

The following background documents are available for download at:

<http://yosemite.epa.gov/r10/cleanup.nsf/ph/arkema>

[Treatment of Groundwater from the Arkema Facility in Portland, Oregon: Bench-Scale Treatability Study \(PDF\)](#) (188 pp. 1.7MB to start) - April 10, 2008

[Groundwater Source Control Evaluation Addendum I \(PDF\)](#) (83 pp. 5MB) - March 2008

[Summary of Remedial Technology Alternatives, Groundwater Source Control Interim Remedial Measure Focused Feasibility Study \(PDF\)](#) (23 pp. 2.6MB) - January 2, 2008

[Groundwater Source Control Evaluation \(PDF\)](#) (249 pp. 8.4MB) - April 17, 2007.

Sincerely,

Matt McClincy
Project Manager
Portland Harbor Section

cc: TCT